Nephrotic Syndrome in Adults

National Kidney and Urologic Diseases Information Clearinghouse

National Institute of Diabetes and Digestive and Kidney Diseases

What is nephrotic syndrome?

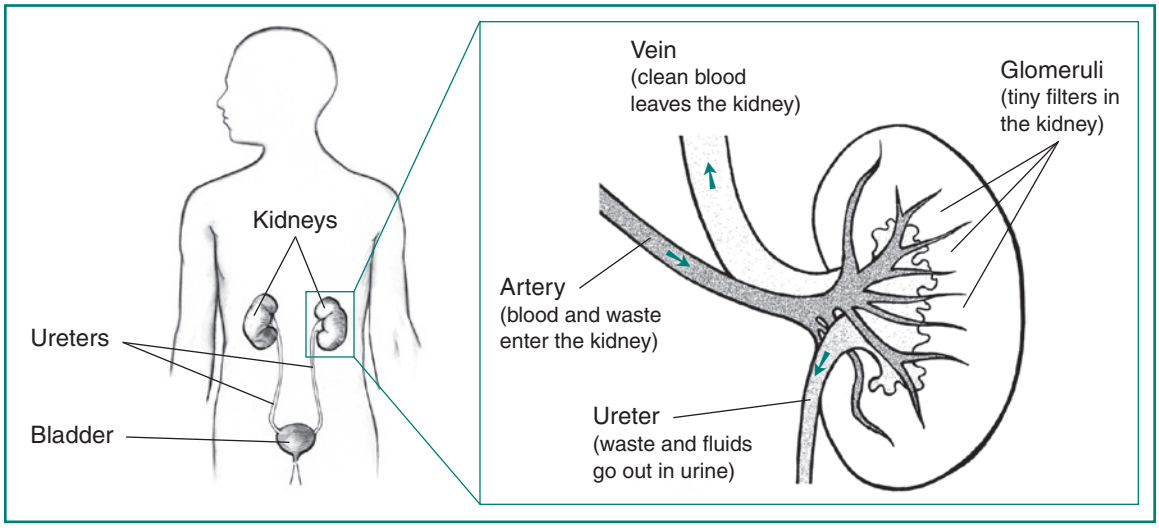
Nephrotic syndrome is a collection of symptoms that indicate kidney damage. Nephrotic syndrome includes the following:

- proteinuria—large amounts of protein in the urine
- hyperlipidemia—higher than normal fat and cholesterol levels in the blood
- edema, or swelling, usually in the legs, feet, or ankles and less often in the hands or face
- hypoalbuminia—low levels of albumin in the blood

Albumin is a protein that acts like a sponge, drawing extra fluid from the body into the bloodstream where it remains until removed by the kidneys. When albumin leaks into the urine, the blood loses its capacity to absorb extra fluid from the body, causing edema.

Nephrotic syndrome results from a problem with the kidneys' filters, called glomeruli. Glomeruli are tiny blood vessels in the kidneys that remove wastes and excess fluids from the blood and send them to the bladder as urine.

As blood passes through healthy kidneys, the glomeruli filter out the waste products and allow the blood to retain cells and proteins the body needs. However, proteins from the blood, such as albumin, can leak into the urine when the glomeruli are damaged. In nephrotic syndrome, damaged glomeruli allow 3 grams or more of protein to leak into the urine when measured over a 24-hour period, which is more than 20 times the amount that healthy glomeruli allow.



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What causes nephrotic syndrome?

Nephrotic syndrome can be caused by diseases that affect only the kidneys, such as focal segmental glomerulosclerosis (FSGS) or membranous nephropathy. Diseases that affect only the kidneys are called primary causes of nephrotic syndrome. The glomeruli are usually the targets of these diseases for reasons that are not fully understood. In FSGS—the most common primary cause of nephrotic syndrome—scar tissue forms in parts of the glomeruli. In membranous nephropathy, immune molecules form harmful deposits on the glomeruli.

Nephrotic syndrome can also be caused by systemic diseases, which are diseases that affect many parts of the body, such as diabetes or lupus. Systemic diseases that affect the kidneys are called secondary causes of nephrotic syndrome. More than 50 percent of nephrotic syndrome cases in adults have secondary causes, with diabetes being the most common.[1]

What are the signs and symptoms of nephrotic syndrome?

In addition to proteinuria, hyperlipidemia, edema, and hypoalbumina, people with nephrotic syndrome may experience

- weight gain
- fatigue
- foamy urine
- loss of appetite

What are the complications of nephrotic syndrome?

The loss of different proteins from the body can lead to a variety of complications in people with nephrotic syndrome. Blood clots can form when proteins that normally prevent them are lost through the urine. Blood clots can block the flow of blood and oxygen through a blood vessel. Loss of immunoglobulins—immune system proteins that help fight disease and infection—leads to an increased risk of infections. These infections include pneumonia, a lung infection; cellulitis, a skin infection; peritonitis, an abdominal infection; and meningitis, a brain and spine infection. Medications given to treat nephrotic syndrome can also increase the risk of these infections. Other complications of nephrotic syndrome include

- hypothyroidism—a condition in which the thyroid gland does not produce enough thyroid hormone to meet the body's needs
- anemia—a condition in which red blood cells are fewer or smaller than normal, which means less oxygen is carried to the body's cells
- coronary artery disease, also called coronary heart disease—heart disease caused by narrowing of the arteries that supply blood to the heart
- high blood pressure, also called hypertension—a condition in which blood flows through the blood vessels with a force greater than normal
- acute kidney injury—sudden and temporary loss of kidney function

[1]Nephrotic Syndrome. The Merck Manuals Online Medical Library. www.merckmanuals.com/professional/genitourinary_disorders/glomerular_disorders/overview_of_nephrotic_syndrome.html?qt=Nephrotic Syndrome in Adults&alt=sh. Updated March 2013. Accessed December 4, 2013.

How is nephrotic syndrome diagnosed?

Urine samples are taken to diagnose people suspected of having nephrotic syndrome.

Nephrotic syndrome is diagnosed when large amounts of protein are found in the urine. The blood protein albumin makes up much of the protein that is lost, though many other important proteins are also lost in nephrotic syndrome.

The presence of albumin in the urine can be detected with a dipstick test performed on a urine sample. The urine sample is collected in a special container in a health care provider's office or commercial facility and can be tested in the same location or sent to a lab for analysis. For the test, a nurse or technician places a strip of chemically treated paper, called a dipstick, into the urine. Patches on the dipstick change color when protein is present in urine.

A more precise measurement is usually needed to confirm the diagnosis. Either a single urine sample or a 24-hour collection of urine can be sent to a lab for analysis. With the single urine sample, the lab measures both albumin and creatinine, a waste product of normal muscle breakdown. The comparison of the measurements is called a urine albumin-to-creatinine ratio. A urine sample containing more than 30 milligrams of albumin for each gram of creatinine may signal a problem. With a 24-hour collection of urine, the lab measures only the amount of albumin present. The single urine sample is easier to collect than the 24-hour sample and is usually sufficient to confirm diagnosis, though the 24-hour collection may be used in some cases.

Once nephrotic syndrome is diagnosed, blood tests are usually needed to check for systemic diseases that may be causing the nephrotic syndrome and to find out how well the kidneys are working overall. A blood test involves drawing blood at a health care provider's office or commercial facility and sending the sample to a lab for analysis.

Though blood tests can point toward systemic diseases, a kidney biopsy is usually needed to diagnose the specific underlying disease causing the nephrotic syndrome and to determine the best treatment. A kidney biopsy is a procedure that involves taking a piece of kidney tissue for examination with a microscope. Kidney biopsies are performed by a health care provider in a hospital with light sedation and local anesthetic. A biopsy is often not needed for a person with diabetes because the person's medical history and lab tests may be enough to diagnose the problem as being a result of diabetes.

How is nephrotic syndrome treated?

Treating nephrotic syndrome includes addressing the underlying cause as well as taking steps to reduce high blood pressure, edema, high cholesterol, and the risks of infection. Treatment usually includes medications and changes in diet.

Medications that lower blood pressure can also significantly slow the progression of kidney disease causing nephrotic syndrome. Two types of blood pressure lowering medications, angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs), have proven effective in slowing the progression of kidney disease by reducing the pressure inside the glomeruli

and thereby reducing proteinuria. Many people require two or more medications to control their blood pressure. In addition to an ACE inhibitor or an ARB, a diuretic—a medication that aids the kidneys in removing fluid from the blood—can also be useful in helping to reduce blood pressure as well as edema. Beta blockers, calcium channel blockers, and other blood pressure medications may also be needed.

Statin medications may be given to lower cholesterol.

People with nephrotic syndrome should receive the pneumococcal vaccine, which helps protect against a bacterium that commonly causes infection, and yearly flu shots.

Blood thinning medications are usually only given to people with nephrotic syndrome who develop a blood clot; these medications are not used as a preventive measure.

Nephrotic syndrome may go away once the underlying cause has been treated. More information about treating the underlying causes of nephrotic syndrome can be found in the National Kidney and Urologic Diseases Information Clearinghouse publication *Glomerular Diseases* at *www.kidney.niddk.nih.gov.*

Eating, Diet, and Nutrition

Eating, diet, and nutrition have not been shown to play a role in causing or preventing nephrotic syndrome in adults. For people who have developed nephrotic syndrome, limiting intake of dietary sodium, often from salt, and fluid may be recommended to help reduce edema. A diet low in saturated fat and cholesterol may also be recommended to help control hyperlipidemia.

Points to Remember

- Nephrotic syndrome includes the following:
  - proteinuria—large amounts of protein in the urine
  - hyperlipidemia—higher than normal fat and cholesterol levels in the blood
  - edema, or swelling, usually in the legs, feet, or ankles and less often in the hands or face
  - hypoalbuminia—low levels albumin in the blood
- Primary causes of nephrotic syndrome are diseases that affect only the kidneys, such as focal segmental glomerulosclerosis (FSGS). Secondary causes of nephrotic syndrome are diseases that affect many parts of the body, such as diabetes.
- In addition to proteinuria, hyperlipidemia, edema, and hypoalbumina, people with nephrotic syndrome may experience
  - weight gain
  - fatigue
  - foamy urine
  - loss of appetite
- The loss of different proteins from the body can lead to a variety of complications in people with nephrotic syndrome.
- Treating nephrotic syndrome includes addressing the underlying cause and taking steps to reduce high blood pressure, edema, high cholesterol, and the risks of infection. Treatment usually includes medications and changes in diet.

Hope through Research

In recent years, researchers have learned much about kidney disease. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) sponsors several programs aimed at understanding glomerular diseases such as FSGS and membranous nephropathy, which are primary causes of nephrotic syndrome. The NIDDK also studies diseases such as lupus and diabetes, which are secondary causes of nephrotic syndrome. Finding treatments for these underlying causes will help prevent nephrotic syndrome or stop its progression.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit *www.ClinicalTrials.gov.*

For More Information

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You may also find additional information about this topic by visiting MedlinePlus at *www.medlineplus.gov.*

This publication may contain information about medications. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1–888–INFO–FDA (1–888–463–6332) or visit *www.fda.gov.* Consult your health care provider for more information.

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The National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1987, the Clearinghouse provides information about diseases of the kidneys and urologic system to people with kidney and urologic disorders and to their families, health care professionals, and the public. The NKUDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about kidney and urologic diseases.

This publication is available at *www.kidney.niddk.nih.gov.*

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